

3-Jan-2021

* CLASSFUL Network

Addressing 20

* Classful Addressing waste.

* Classless Inter-Domain Routing.
(CIDR)

/23

// 23 bits are send to Network part

• 22 bits " /22 " " " "

Similarly /21 means 21 bits are on
network side - //*

* CIDR & Route summarization.

* Static Routing CIDR example,

* Classless Routing protocol Example,

* VLSM Example.

/14

8 bits 6 bits on

11111111 111111 00
255 252

* Calculate a Summary Route.

255 · 252 · 0 · 0

Network.

* Summarize IPv6 Addresses.

* Calculate IPv6 Network Address.

* When primary Route got down off
Stops functioning that's
Called failover.

YTM
 *Configure a Floating Static Route.
 10 January 2021

TCP / IP
 is not a Routing protocol -
 But it is an addressing protocol.

Routers must have installed Same
 Dynamic protocols -

When routers exchange all
 information of Router ie Routing
 table info. - The Network is now
 Set to Converged Network.

RIP is slow to converge,
 OSPF & EIGRP are faster to converge.

IGP VS EGP Gateway protocols,

Link-State Routing Protocol.

It gives updates about Links
 which are up & down.

Classful Routing Protocols.

Classless Routing Protocols.

Provides info. including Subnet
 masks information -

10-Jan-2021

NTP

NETWORK TIME PROTOCOL

- * NTP Synchronizes the time of among a set of distributed time servers & clients.
- * NTP Synchronizes so you can correlate system logs & other time specific events from multiple network devices.
- * Stratum is used by NTP to describe the distance b/w a device & time source.
 - Stratum 1 = Time Source is directly attached.
 - Stratum 2 = Time is received from a Stratum Source via NTP.

CODE :-

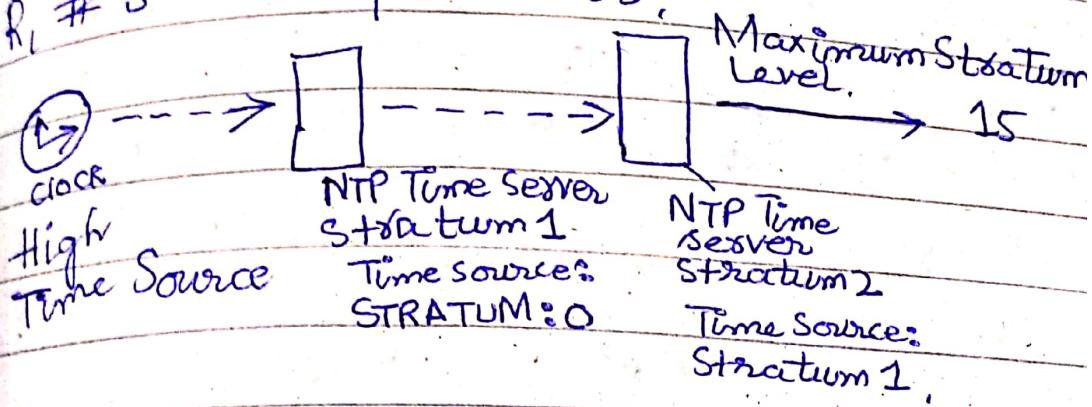
```
R1(Config)# int fa0/0
: ip address 1.0.0.1 255.0.0.0
: no shutdown
: exit.
```

1 :- check Router clock before NTP configuration.

Show clock,

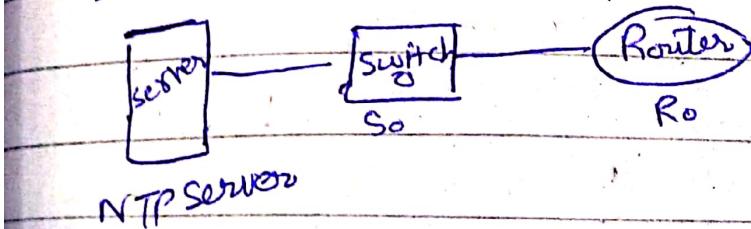
(12)

- 51 → Enable NTP servers on NTP Machine.
- R1 (config) # ntp server 1.0.0.200
- R1 # exit.
- 52 → Check Date & Time after NTP.
- R1 # show clock.
- 53 → Trouble Shooting Command.
- R1 # Show ntp status.



1.0.0.200

f0/0 1.0.0.1

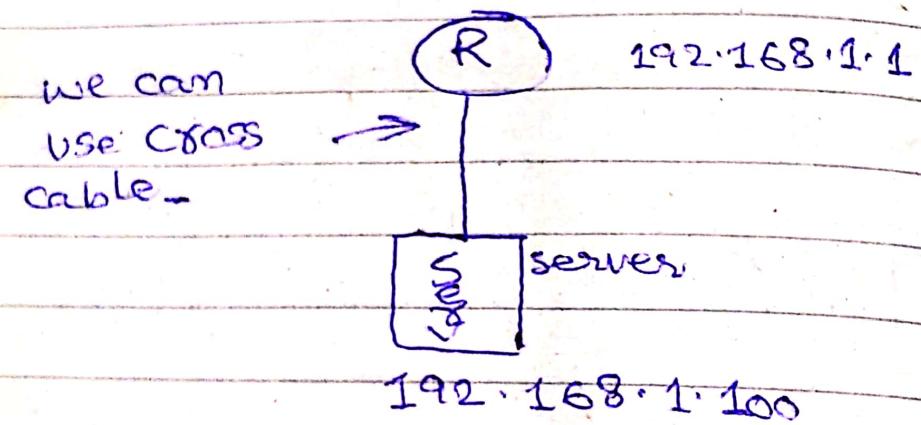


11-Jan-2021 SYSLOG

(B)

To know the status of any device we use Sys Log Server.

Any event which is occurring in device is called Log - Admin use this Logs to find solution of troubleshooting device -



R^(config)
int fa 0/0
R(config) # ip add 192.168.1.1
255.255.255.0
no shutdown.

R (Config) # logging host
192.168.1.100
R (Config) # logging trap
debugging

(14)

11-Jan-2021

Logging Trap (Severity Levels)

- | | |
|----------------|-----------------|
| 0 - 7 | 6 informational |
| 0 emergency | 7 Debugging |
| 1 Alert | |
| 2 Critical | |
| 3 Error | |
| 4 Warning | |
| 5 Notification | |
- ↑
Less Severe

(Mostly Humans pass "5" ka logSeverity ala
hy).

SYSLOG Messages: Admin need
These msgs to know what type of
error is found in the device -

- ① Logging Buffer (RAM) inside
a Router or Switch
- ② Console Line -
- ③ Terminal Line -
- ④ Syslog Server -
(Mostly Syslog Server per.
Syslog Msg bty hyn)

R # debug ip icmp

R # ping 192.168.1.100

25
Jan - 2021

THEORY

15

Router RIP Configuration Mode
Advertising Networks -

BGP protocol is used in INTERNET

Distance Vector protocol. (It's not a protocol)
Link-State protocol. (It's a Methodology followed by protocols)

Kisi bhi Class IP me agr Subnetting perform ki gyi hy to ye classless IP hogi -

Methodology

Distance Vector Protocol only give DS shares routing info. of the neighbour Router - It update this information after every 30 seconds.

Advertising I Pv6 Networks.

Dijkstra's Algorithm
(Shortest Path first Algorithm)

LSA = Link State Advertisement

Link State Method Me Isse pehle LSA share karte hain Routers -

& phir iske pass Link-State Database (LSDB) jaega - Phir ye SPF (shortest path first) Banak kehega or it...

16 Jan - 2021

LAB ACL

(16)

ACCESS CONTROL LIST (Used for Packet Filtering)

① Standard Access List (1-99) → Place the standard ACL near the destination.

② Extended Access List (100-199) → Place the extended ACL near the source.

Distance Vector

RIP, EIGRP

Link State

OSPF

Path Vector

BGP

EIGRP works on Bandwidth + Delay

OSPF " " Cost

RIP " " Hop Count

Standard Access List (Full Port Block to all users or services)

Extended Access List (Blocks Any Particular port / service)

NOTE :-

If port Near to Destination of Standard ACL

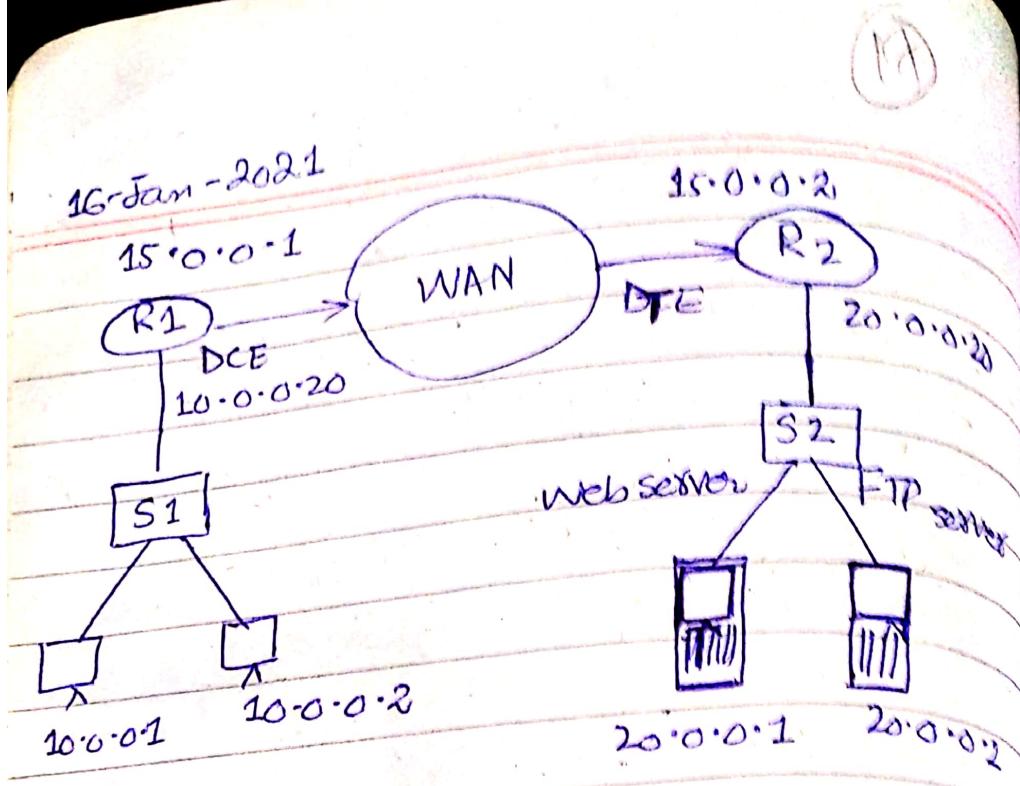
In Serial Link apply to Standard ACL till R1

Point of R1 Because Server is destination Under R2,

Is tarha PC A kye HTTP & FTP ki services

OPP hojaengi OR PCB kye Services on

Yahengi -



R1 # sh ip route

R1 (config) # Router rip

network 10.0.0.0

network 15.0.0.0

R1 # sh ip route

R2 # sh ip route

R2 (config) # Router rip

network 15.0.0.0

network 20.0.0.0

R2 # sh ip route

Now Goto Computer A → Web Browser

write `http://20.0.0.1` press [Go]

This will show in URL the Cisco Packet Tracer

web-page - Similarly 20.0.0.2 press [Go]

[Go] - It will show Cisco PT page -

Which means Both PC's are accessible via HTTP & FTP Servers

STANDARD ACL
config)# access-list 10 deny host 10.0.0.1
ip access-list 10 permit any.

(18)

config)# int s0/0/0
ip access-group 10 out.

16-Jan-2021

THEORY

(19)

Dynamic Protocols (Continued)

Link - State Protocol, me Network Topology share hop - Shortest path found known hop

Ta = 100 Mbps

Giga = 1000 Mbps infact 1024 Mbps,
bit

* Advantages & Disadvantages of Link - State Methodology -

* Remote Network Entries

Routing Table Terms.

Routes are discussed in terms of:

Ultimate route

Level 1 route

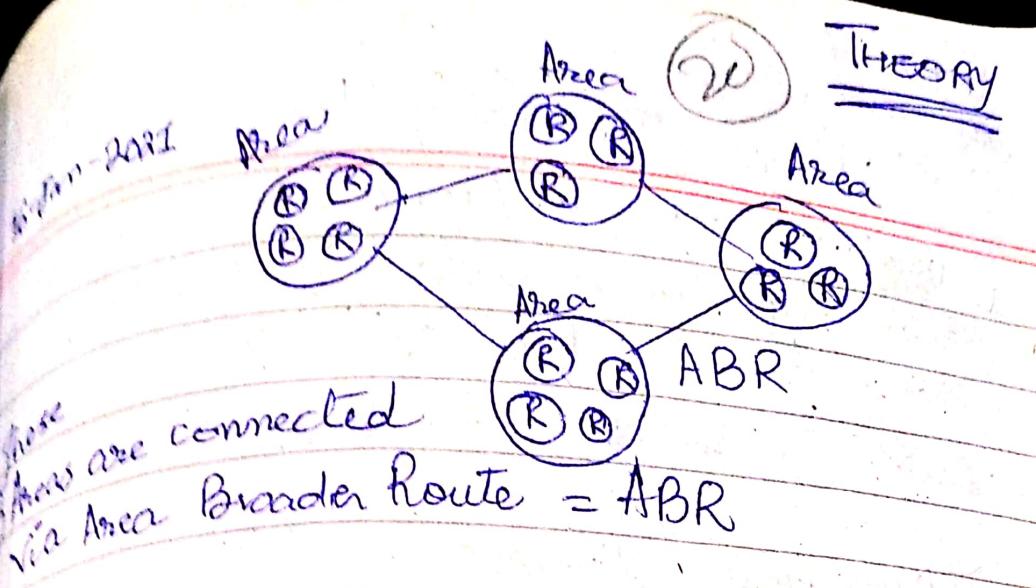
Level 1 parent route

Level 2 child routes

Ultimate route is RT entry that has info. of either next hop IP. Add. or it's exit interface IP Add,

Sources of Level 1 Route,

Route Look up Process



- * Features of OSPF
- * Components of OSPF

[Windows me Print Route Command Se]
Routing Logo Dekh Sakte hain -

17-Jan-2021

* Encapsulating OSPF Messages

OSPF k packets / MSG packets TCP/IP Mode
k packets se different hote hain -

Data Link Frame	IP Packet Header	OSPF Packet Header	OSPF Packet Type Specific Database
-----------------	------------------	--------------------	------------------------------------

OSPF k packets alag alag tarha
k hoty hain - Mukhtif kism k Packe
send karta hy OSPF -

<u>OSPF</u>	<u>Messages</u>	<u>Type</u>
* Hello	* DBD	* LSR

THEORY

POINT - TO - POINT NETWORK

if two networks / devices are connected directly This is called Point To point Network - In which there is no device in between to share it -

* Hello Packet Intervals -

* Link-State Updates -

DR and BDR election only occurs on multi-access networks such as Ethernet LANs.

Lowest IP. ID ki priority Karna hy -

Highest IP. ID ki priority Liada hy -

THEORY

22-Jan-2021

$$\text{Cost} = \frac{\text{Reference Bandwidth}}{\text{Actual Bandwidth}} \quad 10$$

Similarities B/w OSPF2 & OSPF3

24-Jan-2021

General Guidelines for Creating

ACLs -

* Router / Firewall ki Boundary per
ACL apply ki jaegi -

types of statement of ACL

① Host Statement ② Range Statement

ACL statements sequentially execute

note hain -

EK ACL me Multiple statements hoty hyn.

Kisi bhi Source ko deny karne ki bad

baqi ki sources ko allow karne karvi

hy - Otherwise sb kyle ^{Permit} service deny

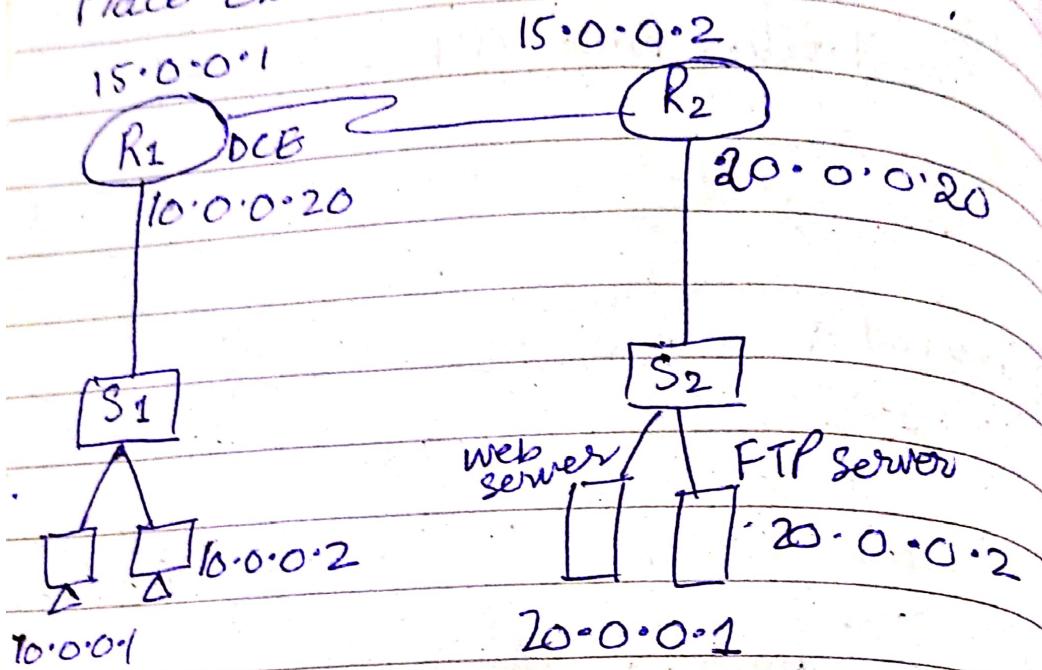
hjiegji -

LAB

23-JAN-2019
Access - LIST (100-199)

EXTENDED

Place Extended ACL near Source



R₁, R₂ # sh ip route

R₁, R₂ (config) # Router IP

R₁ (config) # Router IP

network 10.0.0.0

network 15.0.0.0

R₂ (config) # Router IP

network 20.0.0.0

network 15.0.0.0

R₁ (config) # access-list 110 deny
tcp host 20.0.0.1 eq www
OR
80

R₁ (config) # access-list 110 deny
tcp host 10.0.0.1 host 20.0.0.1 eq
www or 80

(24)

R1 (config) # access-list 110 deny tcp
port 20 0 0 2 eq
f 21

R1 (config) # access-list 110 permit
ip any any

R1 (config) # int fa 0/0

R1 (config) # ip access-group 110 in

(B)

LAB (SUBNET PRAC)

24-Jan-2021

No. of Networks	$= 2^n$	$= m = \text{no. of networks}$
No. of Subnets	$= 2^n$	$: n = \text{no. of subnets}$
No. of Hosts/Subnets	$= 2^n - 2$	$: n = \text{no. host bits}$

Address	8.1.4.5/16	130.4.102.164	192.168.255.255/24
Mask	255.255.0.0	255.255.0.0	255.255.255.0
No. of N/w bits	8	16	24
No. of host bits	16	8	8
No. of Subnet bits	8	8	0
No. of host	$2^{16} - 2 = 65534$	$2^8 - 2 = 254$	$2^{24} - 2 = 16777214$
Per subnet			
No. of subnets	$2^8 = 256$	$2^8 = 256$	0
No. of N/w	$2^8 = 256$	$2^{16} = 65536$	

169.154. — — is link local address ie
 When we want an ip from dhcp but can't
 get it - Then we manually put this in address bar

24-Jan-2021

26

$$130 \cdot 4 \cdot 102 \cdot 1 / 25 = \text{I.P}$$

$$255 \cdot 255 \cdot 255 \cdot 128 = \text{Subnet Mask}$$

16

= No. of N/w bits

7

= No. of Host bits

9

= No. of Subnet bits

$$130 \cdot 4 \cdot 102 \cdot 1 / 26 = \text{I.P}$$

$$255 \cdot 255 \cdot 255 \cdot 192 = \text{Subnet Mask}$$

16

= No. of N/w bits.

6

= No. of ~~Subnet~~ Host bits

=

$$130 \cdot 4 \cdot 6 \cdot 1 / 8$$

$$\text{No. of N/w} = 16$$

$$\text{No. of Subnets} = 0$$

$$\text{No. of host} = 16$$

$$2^0 = 1 \Rightarrow 2^{16} - 2 = 65534$$

Classes:

$A = 0 - 126$	General,
$B = 128 - 191$	
$C = 192 - 255$	

10.0.0.0 (Private A)

172.16.0.0 (Private B)

192.168.0.0 (Private C)

127.0.0.1 = LoopBack Address To check

NIC = Network interface card.

24-Jan-21

SUBNETTING



Octet	1	2	3	4
IP Add				

~~11111111 11111111 11111111 11111111~~
Subnet bits = 16

IP: $130 \cdot 4 \cdot 102 \cdot 1 / 25$ (28 bits)
 $255 \cdot 255 \cdot 0 \cdot 0$
 $\cdot 255 \cdot 255 \cdot 255 \cdot 128$
Sub.

NA = $130 \cdot 4 \cdot 102 \cdot 0$

First Add = $130 \cdot 4 \cdot 102 \cdot 1$

Last Add = $130 \cdot 4 \cdot 102 \cdot 254$

Broadcast add = $130 \cdot 4 \cdot 102 \cdot 255$

IP: $130 \cdot 4 \cdot 102 \cdot 1 / 27$

Def: $255 \cdot 255 \cdot 0 \cdot 0$

$224 = 11100000$
 $1 = 00000001$
 $\underline{-----}$
0

Subnet Mask: $255 \cdot 255 \cdot 255 \cdot 224$

Net. Add: $130 \cdot 4 \cdot 102 \cdot 0$

First Add: $130 \cdot 4 \cdot 102 \cdot 1$

Last Add: $130 \cdot 4 \cdot 102 \cdot 254$

Broad. Add: $130 \cdot 4 \cdot 102 \cdot 255$

IP: $130 \cdot 4 \cdot 102 \cdot 236 / 27$

Def: $255 \cdot 255 \cdot 0 \cdot 0$

Subnet Mask: $255 \cdot 255 \cdot 255 \cdot 224$

New Add: $130 \cdot 4 \cdot 102 \cdot 224$

First: $130 \cdot 4 \cdot 102 \cdot 225$

Last: $130 \cdot 4 \cdot 102 \cdot 255$

Broad: $130 \cdot 4 \cdot 102 \cdot 254$

W
 subnet bits = 3
 IP 199.1.1.1 - 199.1.1.100 / 27
~~199.1.1.1 - 199.1.1.96 / 24~~
 Sub 255.255.255.0
 N.A 199.1.1.1 - 96
 First 199.1.1.1 - 97
 Last 199.1.1.1.126
 Broadcast 199.1.1.127

Broadcast mukalme k liye 96
 k binary me jitne zero bits
 right side per ham (i.e. left k
 baad wale zero's only) - In 2nd
 ko 1's me convert kar

199.1.1.100 / 30
 IP 199.1.1.100 / 30
 Subnet 255.255.255.252
 N.A = 199.1.1.100
 First : 199.1.1.101
 Last : 199.1.1.103
 Broadcast : 199.1.1.102

AND Operation to find Network
 252 =
 [100

28 - Jan - 2021

THEORY

- * Comparing IPv4 & IPv6 ACLs -
- * Configuring IPv6 - ACLs
- * Applying an IPv6 ACL to an Interface

* TCP / IP

Transport Layer has Segments

Within Segments -

Header Payload

* TCP Packet Datagram

Session Layer ka Datagram Transport
ki Segment me "Payload" bajeega,

TCP is Connection Oriented -

OR ye decide karta hy k Kis port par
bat keni hy -

~~Transport~~ + Network layers are combined to
make communication b/w two devic

TCP's HEADER Is Most IMPORTANT

because it has the information of Source & destination

almost 460 bytes ka data ek header
one nota hy -

Tcp travels in Packet Switching
Network And takes different paths to
destination -

THEORY

(52)

28-Jan-2021

Set means 1
Reset means 0
more often but not necessarily -
Sequence No.
Data Offset
Reserved

TCP HEADER

URG (urgent flag)

ACK Acknowledgment Flag

PSH push Flag

RST (Reset Flag)

SYN (Synchronize Flag)

FIN (End of data)

Window (No. of octets in TCP header)

Checksum (Used for acknowledgment and check for data integrity)

Urgent pointer. (when URG Flag is on its on).

Options.

Padding data

header length = 20 bytes.
Header?

Calculation of Source port
Destination port
is important,

Calculate fragmentation
of 64K data.

UDP
HEADER

- ① Source port no.
- ② Destination
- ③ Total length of UDP
- ④ Length of data
- ⑤ IP frame max. total length of 65535 bytes
What's max length of data in a UDP frame?
- ⑥

28 Jan 2021

(3)

Most Imp.

Theory

IPv6 Transition Method

- ① Dual Stack : Runs both IPv4 & IPv6 on same devices
- ② Tunneling : Transporting IPv6 traffic via an IPv4 n/w transparently.
- ③ Translation : Converting to IPv6 traffic to IPv4 traffic for transport & vice versa -

Packets se sequence ka pada rai lega
sequence koi info. Segments me pta bhi
kyo jis packet open hota hoga - (IP &
HEADER ME)

29-Jan-2021

SUBNETTING

35

Given IP: 204.17.5.0
 Subnet mask: 255.255.255.224
 LAN

How many networks = ?

How many Subnets = ?

How many host = ?

Host add. range = ?

204.17.5.0

11000100.0001000100000101.0000

255.255.255.224

11111111.11111111.11100000.
 S-bits H=5
 =3

H-Bits = 5 = 32

No. of Subnets = $2^{(\text{Subnet bits})}$ = 2^5

No. of Subnets = 8

No. of Hosts = $2^5 - 2$ =

No. of Hosts = 32 - 2

No. of Networks = 2^n = 2^{24}

No. of Networks = $2^{24} = 16777216$

~~Any~~ Block Size = $32 - 2 = 30$

1 in Range = 30 hosts,

8/18/2021

SUBNETTING

LAB

204.17.5.0 255.255.255.224 Host Add Range
1 to 30

204.17.5.32 255.255.255.224 HAR = 33 to 62

204.17.5.64 HAR = 65 to 94 = 65 to 94

204.17.5.96 HAR = 97 to 126 = 129 to 158

204.17.5.128 HAR = 129 to 158 = 161 to 190

204.17.5.160 HAR = 161 to 190

204.17.5.192 HAR = 193 to 222

204.17.5.224 HAR = 225 to 254

204.17.5.256 HAR = 257 to 286

BeCoz = we have 8 Subnets,

ASSIGNMENT HOW

256
224
32

: 204.17.5.0 / 28

: 172.16.192.0

: 172.16.192.0 / 20

111111 111111 0. 0 → 111111 111111 111000000000

255.255.255.240

29-Jan-2021

THEORY

IP HEADER

- (1) Version
- (2) Header length
- (3) Type of Service
- (4) Packet length
- (5) Identification
- (6) Flags
- (7) Fragment offset
- (8) Time to live (TTL)

Flag :- 3 bit

For e.g.: If Flag "0" zero hoga it means it is the only fragment or chunk of data or is k bad koi fragment mai aega. If Flag "1" hoga it means k is bad bhi ek or chunk aega - and if 2 hoga to do or chunks aorange - and so on.

Fragment Offset :-

13 bit Value Used in reassembly process at the destination -

Header Checksum :- 16 bit

To check errors in Header only -

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Classful		
Class	A	255.0.0.0
Class	B	255.255.0.0
Class	C	255.255.255.0

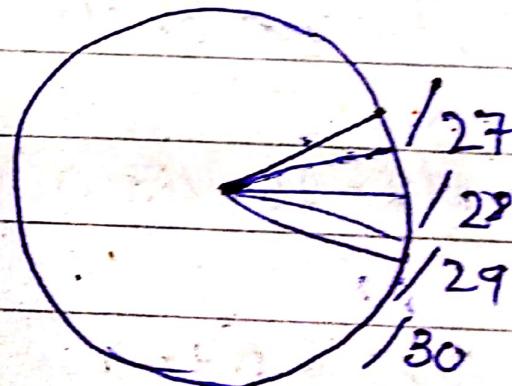
CIDR Classless Interdomain Routing -
 $10 \cdot 0 \cdot 0 / 24$

Classless because its N/w occupies more

$192 \cdot 168 \cdot 0 \cdot 0 / 8$

Classless because its N/w bits are minimum to 8 bits while its default N/w bits

are 24 -



$$Q = 172 \cdot 16 \cdot 0 \cdot 0 / 20$$

$$\text{Default Sub} = 255 \cdot 255 \cdot 0 \cdot 0$$

$$\begin{array}{rcl} 1111111 & = & 1111111 \\ 255 & = & 255 \\ & & - 240 \end{array}$$

$$\begin{aligned} \text{Subnet bits} &= 2^4 = 16 \text{ Subnets} \\ \text{No. of Hosts} &= 2^{(N \text{ No. of Host bits})} - 2 = 2^{12} - 2 = 4094 \end{aligned}$$

$$\text{Block Size} = 256 - 240 \Rightarrow$$

$$\textcircled{1} 172 \cdot 16 \cdot 0 \cdot 0 \quad 172 \cdot 16 \cdot 0 \cdot 1 - 172 \cdot 16 \cdot 15$$

$$\textcircled{2} 172 \cdot 16 \cdot 16 \cdot 0 \quad 172 \cdot 16 \cdot 16 \cdot 1 - 172 \cdot 16 \cdot 31$$

$$\textcircled{3} 172 \cdot 16 \cdot 32 \cdot 0 \quad 172 \cdot 16 \cdot 32 \cdot 1 - 172 \cdot 16 \cdot 47$$

$$\textcircled{4} 172 \cdot 16 \cdot 48 \cdot 0 \quad 172 \cdot 16 \cdot 48 \cdot 1 - 172 \cdot 16 \cdot 63$$

$$\textcircled{5} 172 \cdot 16 \cdot 64 \cdot 0 \quad 172 \cdot 16 \cdot 64 \cdot 1 - 172 \cdot 16 \cdot 79$$

$$\textcircled{6} 172 \cdot 16 \cdot 80 \cdot 0 \quad 172 \cdot 16 \cdot 80 \cdot 1 - 172 \cdot 16 \cdot 95$$

$$\textcircled{7} 172 \cdot 16 \cdot 96 \cdot 0 \quad 172 \cdot 16 \cdot 96 \cdot 1 - 172 \cdot 16 \cdot 111$$

$$\textcircled{8} 172 \cdot 16 \cdot 112 \cdot 0 \quad 172 \cdot 16 \cdot 112 \cdot 1 - 172 \cdot 16 \cdot 128$$

$$\textcircled{9} 172 \cdot 16 \cdot 128 \cdot 0 \quad 172 \cdot 16 \cdot 128 \cdot 1 - 172 \cdot 16 \cdot 143$$

$$\textcircled{10} 172 \cdot 16 \cdot 144 \cdot 0 \quad 172 \cdot 16 \cdot 144 \cdot 1 - 172 \cdot 16 \cdot 159$$

$$\textcircled{11} 172 \cdot 16 \cdot 160 \cdot 0 \quad 172 \cdot 16 \cdot 160 \cdot 1 -$$

(46)

⑩ 172.16.176.0

172.16.176.1 - 172.16.191.

⑪ 172.16.192.0

172.16.192.1 - 172.16.201.254

⑫ 172.16.208.0

172.16.208.1 - 172.16.223.254

⑬ 172.16.224.0

172.16.224.1 - 172.16.239.255

⑭ 172.16.240.0

172.16.240.1 - 172.16.

⑮ 172.16.

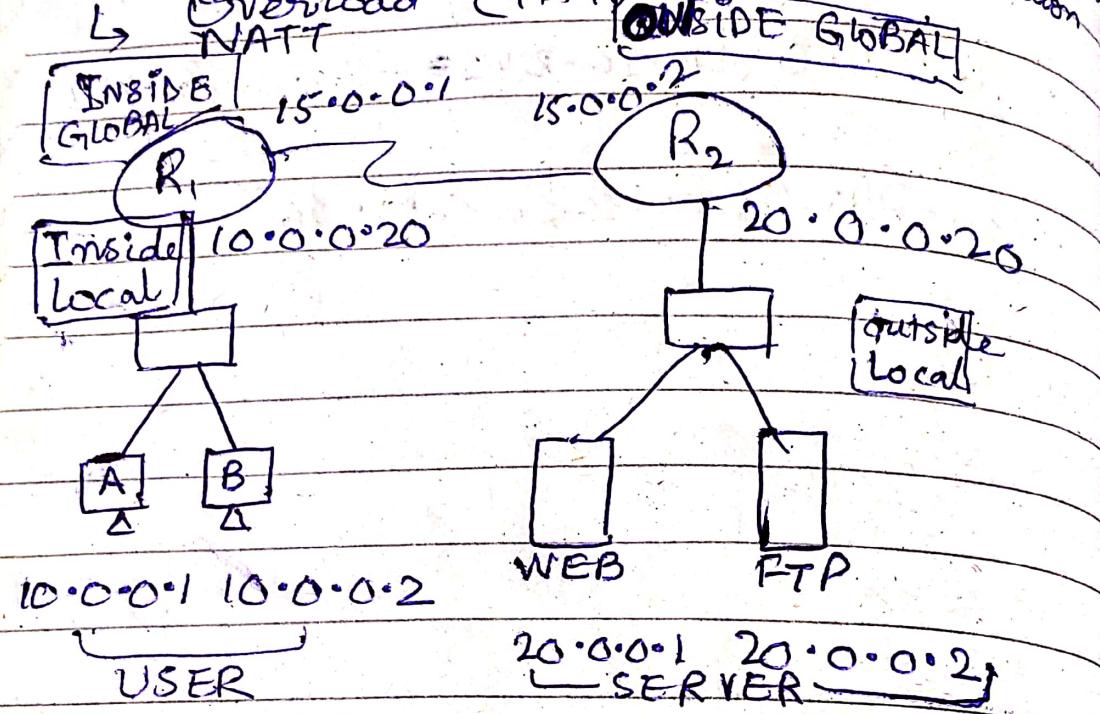
30-Jan-2021

LAB

NETWORK ADDRESS TRANSLATION (NAT)

- ↳ Static
- ↳ Dynamic (NAT)
- ↳ Overload (PAT)

PAT = Port Address Translation



Static Map 1 private IP address to 1 Reserved IP.

Dynamic NAT: Map many Private IP address to many public IP.

Overload NAT(PAT): Map many private IP Address to 1 public address.

W

IPG THEORY

SHORTHENING / COMPACTING

ABCD : 00EF : 3456 : 103B : 0000 : 0000 :
F12B : 00AB

ABCD : FE : 3456 : 103B : 0000 : 0000 :
F12B : AB.

left most zero's ko omit karna hy,
But Jo zero's contiguous honge wohi

short honge -

And :: sirf ek jaga hi use hotska
hy - Do jaga / Do bar :: (double Colon)
use mati hoga -

A :: F12B : AB

A :: 103B :: F12B : AB

00A :: 0000 : 0000 : 00

00A :: 0000 :: 0.000 : 0000 : 0000 : 0000

(13)

255 - 255 - . 252 - . 0
1111111 - 111111 - 1111100 - 0000000
192 - 168 - 1 - 10
11000000 - 10101000 - 00000001 - 00001000
11000000 - 10101000 - 0 - 0
 $N_{ip} = 192 \cdot 168 \cdot 0 \cdot 0$

Header length

Header size atleast, 20 bytes

HLEN = 13

st, 4 bits Version Total
nd, 4 bits Length size = 16 bits.

Longwell

170 - 171

Class

A

O

172 - 191

14

10

24

10

88

B

192 - 220

10

10

10

10

10

10

10

10

C

191 - 210

10

10

10

10

10

10

10

10

Classless

cubane

170 - 171

1

1

1

1

171 - 191

1

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NAT (STATIC)

R1 (config)# ip nat inside source static
10.0.0.1 15.0.0.11

R1 (config)# ip nat inside source static
10.0.0.2 15.0.0.22

R1 (config)# int fa 0/0
ip nat inside

R1 (config)# int S 0/0

ip nat outside

R1 # show ip nat translation
debug ip nat

Host A pings to web server 20.0.0.1

c1) Ping 20.0.0.1

Show ip nat & debug ip nat

Se hume PC1 ki IP 10.0.0.1 ki
bjae 15.0.0.11 Show tregal.

NAT (DYNAMIC)

```
R1(config)# ip nat pool abc  
      15.0.0.1    15.0.0.45 netmask  
      255.0.0.0          netmask  
R1(config)# access-list 1 permit 10.0.0.0  
          0.255.255.255  
#ip nat inside source list 1 pool  
abc
```

```
R1(config)# int fa 0/0  
#ip nat inside
```

```
R1(config)# int 2/0  
#ip nat outside  
#show ip nat translation  
& R1 # debug ip nat
```

NAT (OVERLOAD) (PAT)

Many private ip addresses to 1 public ip address.

```
R1(config)# ip nat pool abc 15.0.0.200  
           15.0.0.200 netmask 255.0.0.0
```

```
R1(config)# access-list 1 permit 10.0.0.0  
          0.255.255.255
```

```
R1(config)# ip nat inside source list 1 pool  
overload
```

```
R1(config)# int fa 0/0  
#ip nat inside
```

int S 2/0
#ip nat outside

bsh ip nat translations
#debug ip nat

LAB → SNMP

1/3/2021
Simple Network Management Protocol
Used to manage (control & monitor)
the n/w infrastructure devices to retrieve
information from n/w infrastructure
Address -
SNMP Components.

MIB (Management Information System)
Database collection of information organized
hierarchically

SNMP Agent : SNMP Client Software
SNMP Manager (NMIS) Monitor &
Control activities of network infrastructure
devices using SNMP.

Default Community string : Read only
Community ,

SNMP Read write Mode

Enable SNMP on R1,

(config)# Snmp - server Community
R1 > 0

Snmp - server community R1 > w > w

Testing SNMP from a PC

→ Desktop → Open MIB Browser,
Wanced

6th Feb 2021

LAB

Address : 192.168.10.1

SNMP

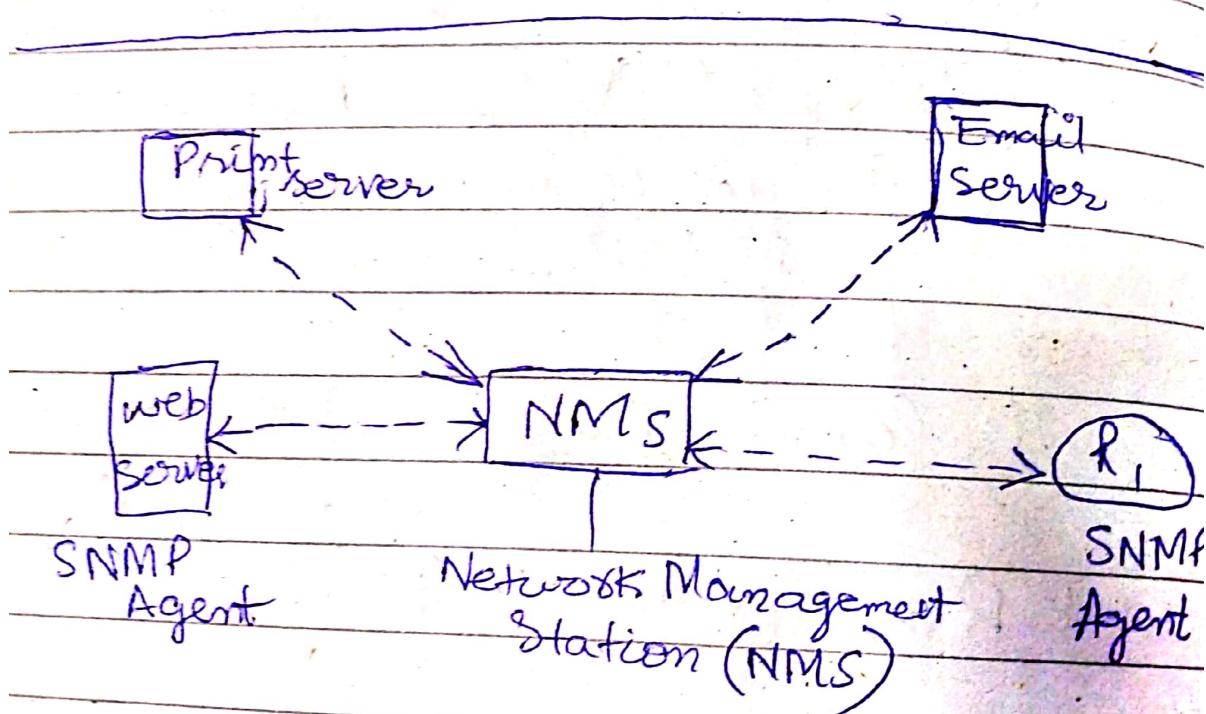
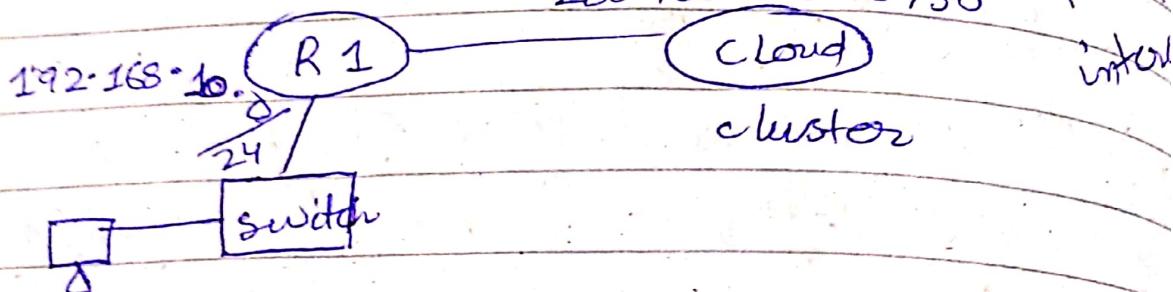
Port : 161

Read community : R1

Write community : R1 & w

Version : V3

200.100.10.0/30 open by



SNMP Message type

GET

SET

TRAP

7/15 - Jan - 2021

THEORY

Comparing IPv4 and IPv6 ACLs

Configuring IPv6 ACLs.

IPv6 ACLs are standard ACLs. Nai hangi.

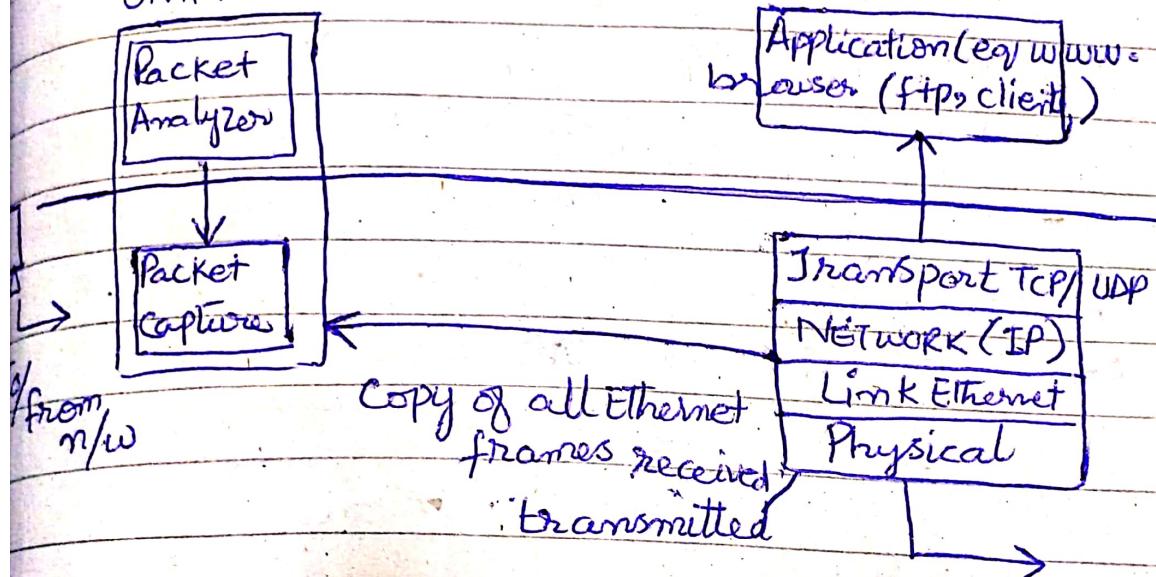
Only Extended ACLs use hoti hym.

* SLAAC

7/15 - Feb - 2021

LAB → INTRODUCTION TO WIRESHARK

PACKET SNIFFER



www.wireshark.org we can download here,

display filters



listing of protocols.
HTTP
DNS
UDP

Details of captured packet



LAB

INTRODUCTION TO WIRESHARK

7th feb. 2024

Packet Content
in Hexadecimal
of ASCII

00	0f
02	09
fe	9e
73	5b

Security revolves around these main aspects →

C Confidentiality
I Integrity
A Authentication

A = Authentication

A = Authorization

A = Accountability

AAA Model,

Konsa user login karta hy,
Konsi services/resources ko
konsi resources/services access kriya jastha hy.
ko access kriya jastha hy -

Study Topic : Digital Forensics.

12- Feb - 2022

THEORY

IPv6 me Natting use mai hoti because
abit wide ip/s by and There are billions
and more IPv6 Addresses available to route.

X — X — X — X

DESIGNING NETWORK

Scaling Network

Dekhenge k kitni Bandwidth use kar hi by,
Niv chokeng to mai kar hi?

Internet humseha CORE LAYER Se Connected hogya

Study Entrepreneur Architecture

Enterprise Campus

Enterprise Edge

Service provider Edge

Remote.

Business Continuity is the main requirement of
every Production House -

LAB

24-Feb-2021

CRYPTOGRAPHY (Encryption)

Process of converting ordinary information (Plain text) into an unintelligible form (Cipher text)

Private Key (Symmetric Algorithm)

Both Sender & Receiver must know the same secret using a private-key held by

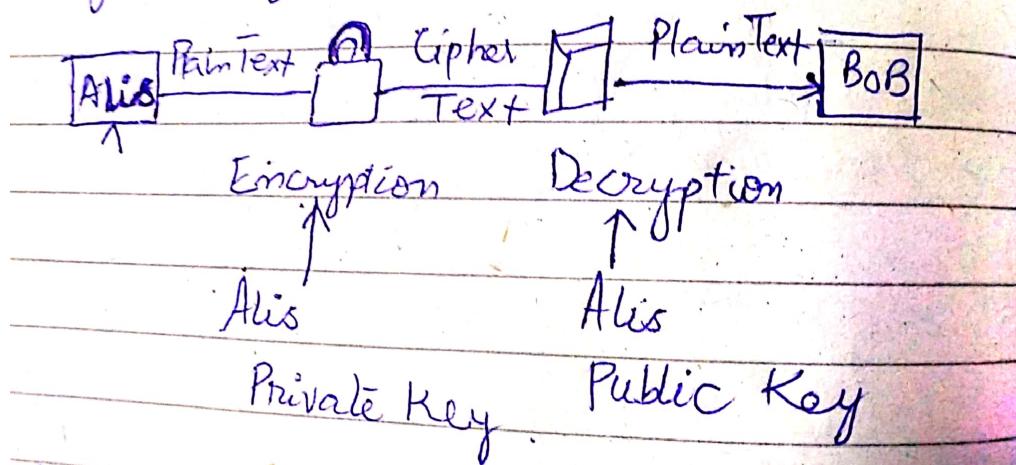
Example :-

DES, 3DES, IDEA, AES, Blowfish, Twofish, RC4, RC5, RCG.

Public Key (Asymmetric Algorithm)

Different keys are used to encrypt & decrypt the data.

Eg:- Diffie Hellman, RSA & ECC



Symmetric 100 - 1000 times faster than Asymmetric,

THEORY

14-Feb-2021

Chap: 2

LAN Redundancy

Issues with Layer 1 Redundancy, broadcast

storms -

Aspects of STP Spanning Tree - Protocol,

Jahan se initiate hole hy info.
wo designated hy.
jis se pochnchi hy info.
so root port.

802.3

Ethernet protocol.
(Most Widely used)

20/ Feb/ 2021

LAB - WIRESHARK LAB - HTTP

- ① HTTP GET / Response interaction
- Startup your browser
 - Startup wireshark packet (But don't begin capture)
 - Enter http in the Sniffer display filter specification window.
 - Wait little, then begin Wireshark packet capture
 - Enter following link to your Browser
<http://gaia-OS-Umass-edu/wireshark-HTTP-wireshark-file1.html>
 - Browser will display Very Simple - One HTML file.
 - Stop wireshark packet capture

TWO Types of HTTP messages,

- GET Message (Browser to web server)
- Response Message (Webserver to browser)

20/feb/2021

VST = VLAN based Spanning Tree

NST = Per VLAN Spanning Tree.

Now VLAN ka apna Spanning tree hoga -

BPDU = Listening / Learning phase me transmit hoty.

Listening State is First process.

Learning State is Second process] Controlling State

Forwarding State is Third in which Communication

b/w data & Frames are taken place :-

Blocking State is Fourth process.

Jahan se data initiate hoga wo Designated port hoga.

Jahan per data Jaega wo Root port hoga,

Different VLANs k numbers associate hene.

Li wajah se - Jo data jis VLAN ka hoga usi forward hoga.

(Port States & PVST + Operation) Imp

RSTP = Rapid Spanning Tree protocol.

Listening + Learning = 1 phase

Forwarding = 2nd phase approx 20 seconds.
Because its rapid STP That's why it fast.

20-06-2021

THEORY

- 3 RSTP BPDU
- 3 Check the Packet details what BPDU packet comprised of.

EDGE PORTS

LINK TYPES

$32768 + 1 \Rightarrow$ Priority of VLAN 1

\ VLAN Number, i.e. VLAN 1

$32768 + 10 \Rightarrow$ Priority of VLAN 10

\ VLAN Number, i.e. VLAN 10

Primary Root

Secondary Root

Agar primary root down hogta to phir
secondary root primary ke jagah
ham krega,

Port Fast and BPDU Guard

RVST + Load Balancing

Fail Over

Repairing a Spanning Tree Problem

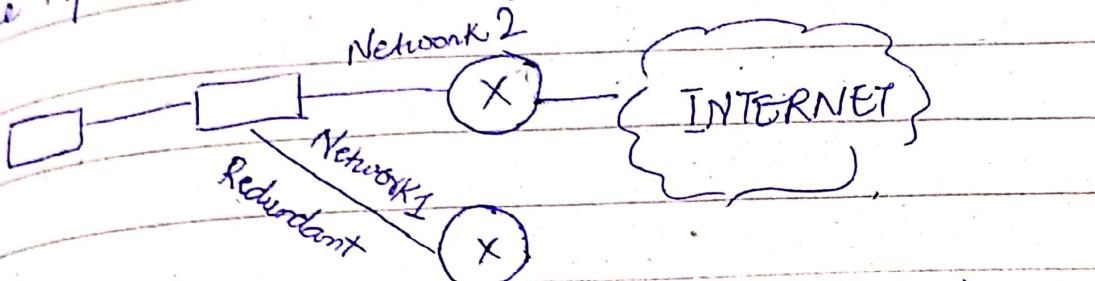
21-Feb-2021

THEORY

Ek Network se do sare Network ko Cross krene
ek Hop kehata hy - Chach Network
switch par ho ya router par

FIRST HOP REDUNDANCY :-

Ab N/w se Nikle Kya jo hop cross krenge



Do routers honge - Ek stand-by per hogा router - Ek wqt me ek router kam krega -
yo Fail Over hy -

But if both routers are up & working
at the same time - This is called
Load Balancing -

First Hop ko akaar Default Gateway ke
data hy -

ROUTER REDUNDANCY

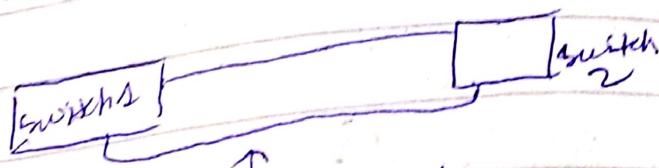
* FIRST HOP REDUNDANCY PROTOCOLS:
go HSRP

* GIBP Verification

21-Ago-2021

THEORY Link AGGREGATION Concepts

Do switches providing redundant Link, and working together which is Ethernet, is also known as Link / Port aggregation.



Redundant Link -

We will create an etherchannel for better bandwidth -

Etherchannel is a form of link aggr. used in switched Networks. Used to achieve high speed -

STP ok hi logical link manage aggregation Link Ko. It's benefit is STP will run fast -)

Agi Etherchannel bana hua hogा to STP per koi effect mali poorega - STP ko path cost re calculate mai karna parega -

* max 16 ports of switch can combined as ether channel - compatibility

PAGP Port Aggregation (Cisco specific)

23/Feb/2021

THEORY,

In P2P Speed of all compatible ports
should be the same - As well as VLANs
should also be the same at both ends -

Range of VLAN - Same range on all interface,
Duplexes will also must same -
modes

Verifying Ether channel
by using Show Commands -
 $x - x - x - x$

WIRELESS CONCEPTS,

Wireless Technologies
WLAN

WPAN

Bluetooth

Wi-Fi = IEEE 802.11 WLAN Standard

WWAN

Two Frequencies 2.4GHz & 5GHz are
being provided in wireless connections -

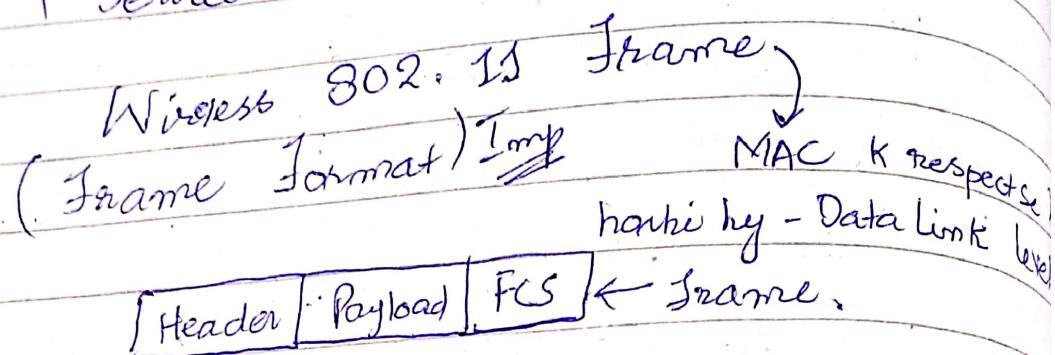
Ethernet LAN use CSMA/CD
Wired N/w

Wireless use CSMA/CA

THEORY

26 - Feb - 2021

- * WIRELESS NETWORKS
- * Personal data on phone (ADHOC Mode)
- * Using backbone Network (Infrastructure Mode)
 - i.e using AP & Router
 - Single Service (Basic Service) Multiple Service (Extended Service)
 - Service set Identifiers SSID



Wireless Frame Type

Connection → Authentication → Association.

Association Parameters,



Analogue = Continuous Signals:

Digital = Discrete Signals. (Currently Used Signals)

SSID Se Frequency Signals Identify hry
hry - K Konsa Signal Kis K net ka hry.

SECURING WIRELESS :-

Frequency Band of 2.4GHz & 5GHz is unlicensed -

3rd - 2021

3. DMZ = Demilitarized Zone

critical devices ko khatya hijn

point server -

point me server rkha jaega kisi bi n/w

DMZ zone me firewall pe - (for security purpose)

Exa m/w jise har koi access na kre -

Routed Protocol

TCP

Jo protocol routing protocols per byte k
jati hy - Routed protocol hoti hy -

2. Adjust & Trouble shoot OSPF,

3. Routing Versus Switching.

Layer 3 Switches have the same functionality
as routers - We can configure OSPF routing proto
on Layer 3 - Currently its been used -

OSPF v3 IP version 6 kya use hota hy

Spoke Topology.

$$ulz = n(n-1)/2$$

OSPF router adjacencies.

27 - Feb - 2021

DR elections.

Router loopback interface.

WLAN Controls

(Access points)

WLAN

WEP = wireless
Encrypted pa

* Internet Delay Values

at 5th - March - 2021

THEORY

EIGRP :-

Distance Vector protocol.

It is more efficient than OSPF. As it only shares the information of only that path which is cost effective -

Ruba

Sends updates only when the route is changed - (Sends partial updates).

Sends bounded updates -

EIGRP replaces TCP with R

EIGRP Packet header **TLV.**

(Type Length Value)

EIGRP Signs neighbours Se info. Share

Karta hy -

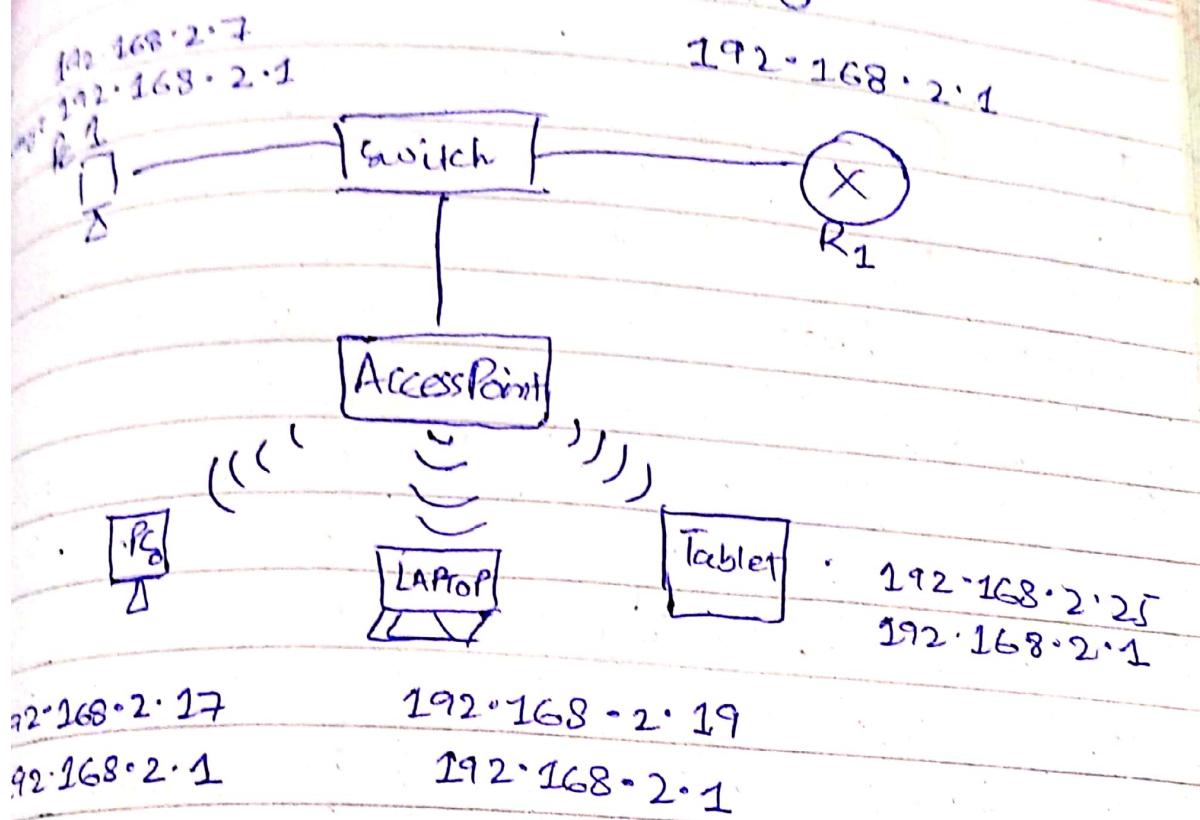
EIGRP 3 baar Hello & Dead Interval w

Krega -

Her routers apni calculations khud kren
small B denotes bits, Capital B denotes Buff

15-March-2021

WIRELESS SCENARIO



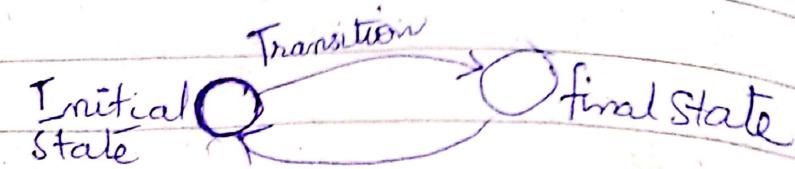
AP

Authentication SSID: KJP
WEP 1234567890

I.

6 - March - 2021 THEORY

Diffusing Update Algorithm (DUAI)



FAT Finite Automata Theory.
State Machine

EIGRP use DUAL FSM = finite state machine
Successors & Feasible Distance

Feasible Successors, Feasibility Condition,
Reported Distance.

Reported Distance = Loop Free distance.

Her neighbour apne pehle wale ka feasible successor

Show IP EIGRP Command

Local Router ka distance Feasible distance

Neighbour Router ka distance Reported distance

neighbour ka distance humesha kum hona chahye-

* EIGRP for IPv6

The mechanism is almost same as IPN4

EIGRP

Passive Interface

For Master and
Autonomous System = System of 3'

0.0.0.0 > Default Route, if you see ip
macrom no. has to Default Route use first hop.

Super networks Contiguous area change,
Supernets is consist of multiple subnetworks.

Aggregation means adding -

Configuring EIGRP Manual Summary Routes

Device to Device Communication via Protocol Protocols.
i.e., TCP / IP.

MD5 is used for Data integrity -

MD5 through Verification happens by -
data send from host is same at the point
where data is received.

Browsing & Certificates to option we exchange
to encryption keys da hui hoti hyn.

Layer 3 Connectivity - Ip to Ip via Ping

Layer 2 Connectivity = Mac to Mac via ARP

7 March 2022 THEORY

Passive Interface

Jis router interface se humne hello packets agay forward mai Karwani hoti hyn - usay hem passive interface bana dete hyn - by using passive-interface command (Isse Routers neighbour mai barsakte)

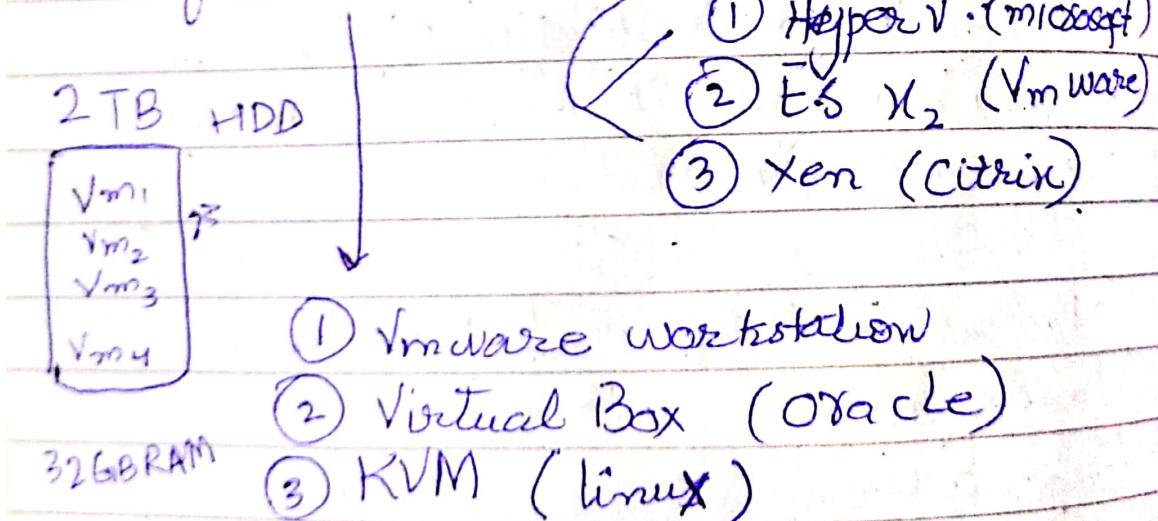
Agar koi N/w reachable na hota Missing n/w statement create hojaga -

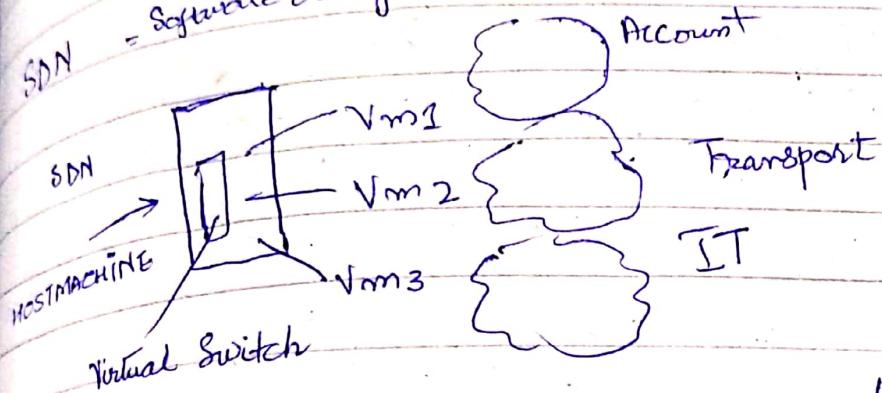
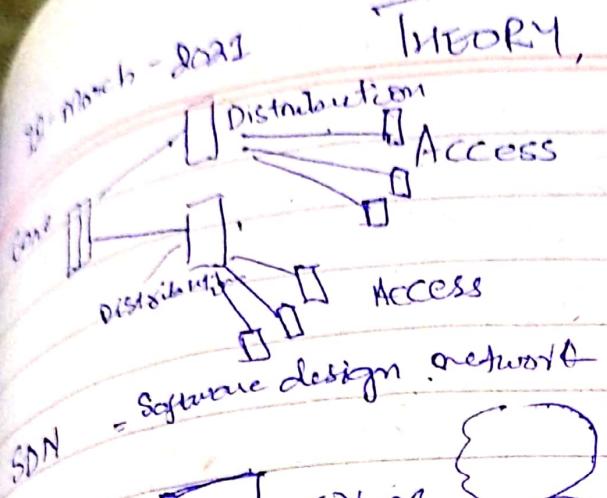
HYPervisor

The software that shares it's resources i.e CPU, RAM, ROM.

Types of Hypervisor :-

- ① Bare Metal Hypervisor ↗
- ② Software based





13-March-2021

THEORY

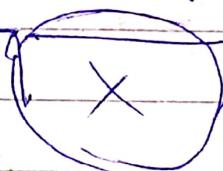
Int S 0/0/0

Switchport mode access

switchport access Vlan

on Layer 2 Switch

Routerport



Int Fa 0/1

Switchport mode access

switchport access Vlan

Layer 3

switch

SSL = Secure Socket Layer

SSH = Secure Shell

Shell = Kernel = Brain of any Operating System

Shell is an environment provided by O.S to user.

K shell, C shell, Bourne shell.

e.g.:

Windows ka shell Command prompt hy.

IEK = Internet Exchange Key.

IP Sec (important),

OR

SSL VPN

VPN me overhead bناجاتا ہے۔
VPN is slow - That's why speed per Mbps